

CLAIMS

1. A method for identifying a series of characteristics of a molecule comprising the steps of:

- (i) converting the characteristics of the molecule into a polynucleotide of defined sequence, wherein each characteristic is represented by at least one distinct unit on the polynucleotide, the unit comprising at least a single base;
- (ii) contacting the polynucleotide with at least one of the nucleotides dATP, dTTP (dUTP), dGTP and dCTP, under conditions that permit the polymerisation reaction to proceed, wherein the at least one nucleotide comprises a detectable label specific for the nucleotide;
- (iii) removing any non-incorporated nucleotides and detecting any incorporation events;
- (iv) removing any labels; and
- (v) repeating steps (ii) to (iv) to thereby identify the different units, and thereby the characteristics of the molecule.

2. A method according to claim 1, wherein each unit on the polynucleotide comprises two or three of the different bases A, T(U), G and C, one of which represents a target for the subsequent incorporation of the detectably labelled nucleotide, and one represents a stop signal, and wherein step (ii) is carried out in the presence of nucleotides complementary to the bases of the unit but in the absence of a nucleotide complementary to that of the stop signal.

25 3. A method according to claim 1 or claim 2, wherein consecutive units on the polynucleotide have a different base type as the target for the incorporation of a labelled nucleotide.

4. A method according to any preceding claim, wherein each unit comprises two bases of the same type as targets for the incorporation of labelled 30 nucleotides, with the two bases optionally separated by one or more of a third base of a different type.

5. A method according to any preceding claim, wherein the molecule is a

target polynucleotide.

6. A method according to claim 5, wherein the characteristic to be identified is the partial or complete sequence of the target polynucleotide.

7. A method according to any preceding claim, wherein the label is a 5 fluorophore.

8. A method according to claim 7, wherein the fluorophore is Alexa-red or Alexa-green.

9. A method according to any preceding claim, wherein the polynucleotide of step (i) is immobilised on a support material.

10. 10. A method according to claim 9, wherein the immobilised polynucleotide forms an array on the support material, the array having a density that permits individual resolution of a detectable label.

11. A method according to any preceding claim, wherein detection is carried out by optical microscopy.

15. 12. A method according to claim 5 and any claim pendent to claim 5, wherein each of the bases A, T(U), G and C on the target polynucleotide is represented by a combination of two sequential units, with each base represented by a different combination of the two units.

13. A method for identifying one or more characteristics of a molecule 20 comprising the steps of:

i) converting the characteristics of the molecule into a polynucleotide of defined sequence, wherein each characteristic is represented by at least one distinct unit comprising at least a two base sequence;

25 ii) contacting the polynucleotide with an oligonucleotide under hybridising conditions, the oligonucleotide being complementary to a unit on the polynucleotide and being detectably labelled;

iii) removing any non-hybridised oligonucleotides and detecting an hybridisation event;

30 iv) removing any label(s); and

v) optionally repeating steps (ii) to (iv) to thereby identify the different units, and thereby the characteristics of the target polynucleotide.

14. A method according to claim 13, wherein the molecule is a polynucleotide and the sequence of the target polynucleotide is determined.
15. A method according to claim 13 or claim 14, wherein the polynucleotide comprising the units is immobilised on a support material.
- 5 16. A method according to claim 15, wherein the immobilised polynucleotide forms an array on the support material, the array having a density that permits individual resolution of a detectable label on each polynucleotide.